

## Effect of Nursing Intervention on Nurses' Performance regarding the Prevention of Deep Vein Thrombosis among Postpartum Women

Shimaa Mohamed Hashem<sup>1</sup>, Ekbal Ebrahim Abdelmenem<sup>2</sup>, Faiza Mohamed EL-Said<sup>3</sup>.

<sup>1, 2 & 3</sup> Lecturer of Maternal and Neonatal Health Nursing, Faculty of Nursing, Tanta University, Egypt.

### Abstract

**Background:** Deep veins thrombosis (DVT) is a common obstetric problem associated with greatest risk of developing pulmonary embolism. Only through early identification of risky women, diagnosis and treatment the morbidity can be reduced. **The aim of this study** was to determine the effect of nursing intervention on nurses' performance regarding the prevention of deep vein thrombosis among postpartum women. **Subjects and Method:** A quasi-experimental research design was used to conduct this study on 100 nurses who were working in the postpartum units at 8 central and general hospitals in El Gharbia governorate, Egypt. **Two tools** were used for data collection, **Tool I:** Assessment of Nurses' knowledge regarding the Prevention of Postpartum Deep Vein Thrombosis Structured Questionnaire and **Tool II:** Assessment of Nurses' Practices regarding the Prevention of Postpartum Deep Vein Thrombosis Observational Checklist. **Results:** there was a highly statistically significant improvement in the total knowledge and practices scores of the participant nurses regarding the prevention of postpartum DVT after provision of the nursing intervention ( $P=0.0001$ ). **Conclusion:** nurses' knowledge and practices regarding the prevention of deep vein thrombosis among postpartum women was enhanced after the implementation of the nursing intervention. **Recommendation:** Further constant learning plans and in-service training programs about DVT preventive measures are necessary for nursing staff to participate actively in early detection and prevention of DVT among postpartum women.

**Key words:** deep vein thrombosis, postpartum women, prevention, nurses'performance

### Introduction

Venous thromboembolism (VTE) is a major health concern during the postpartum period. While the risk of VTE is fivefold during pregnancy, this risk is increased to 60-fold during the postpartum period<sup>(1-3)</sup>. It is considered one of the leading causes of maternal morbidity and mortality, accounting for 10–30% of all maternal deaths in the United States and other Western countries<sup>(2, 4)</sup>. But in Egypt, the precise prevalence of VTE among the general Egyptian population isn't reported. Venous thromboembolism is classified

as deep vein thrombosis (DVT) and pulmonary embolism (PE)<sup>(5)</sup>.

Deep vein thrombosis (DVT) refers to an obstruction of deep veins of the calf, thigh, or pelvis by thrombus associated with inflammation of the vein. The three primary reasons for developing thrombosis during pregnancy and postpartum period include; venous stasis due to pressure of the pregnant uterus on lower extremity vein, endothelial injury during childbirth particularly during forceps-assisted delivery or cesarean

surgery, and hypercoagulability caused by hemostatic system<sup>(6, 7)</sup>. Moreover, there are many different factors that further increase the postpartum women's risk for DVT. These factors include; thrombophilia, hypertension, personal or family history of venous thromboembolism, obesity, smoking, over age older than 35 years, severe varicose veins, immobility for over 3 days, previous DVT and dehydration. In addition to, the obstetrical risk factors which include; multiparity, prolonged labor, still birth, eclampsia, postpartum hemorrhage or infection<sup>(8-13)</sup>.

Deep vein thrombosis is manifested by the following signs and symptoms; edema, warmth, redness and calf pain or tenderness in the affected leg or positive Homan's sign. While in extreme cases, the leg may appear visibly pale or white with diminished pedal pulses. Diagnosis of deep vein thrombosis requires a lot of accuracy. The evidence-based method of diagnosing DVT is the comprehension evaluation of disease risk factors, as well as signs & symptoms. Deep vein thrombosis is a serious and life-threatening condition that can be fatal if not treated<sup>(14-16)</sup>.

The primary goals of DVT treatment are to prevent further thrombus formation or develop pulmonary embolism (PE). Anticoagulant therapy is the treatment of choice. However, if the condition isn't diagnosed early and treated properly many complications may arise. Approximately 50% of DVT may lead to silent PE. Besides, post thrombotic syndrome that is a frequent disabling long term complication of DVT. In recent years, the prevention of postpartum DVT has

been identified nationally and internationally as a priority area for improving patient safety<sup>(17-19)</sup>.

The best standard practices for prevention of DVT are; comprehensive assessment of high risk factors for DVT, starting active and passive range of motion exercise for the lower extremities, early ambulation, leg or foot exercise, elevation of lower extremities, adequate hydration, administering prescribed prophylactic anticoagulant and using mechanical prophylaxis such as graduated compression elastic stocking and intermittent compression devices as compression boots<sup>(20-23)</sup>.

Based on Egypt's Vision 2030 for improving the quality and safety of health services provided in the new republic, the General Authority for Healthcare Accreditation & Regulation developed a clinical standard for the prevention of DVT through examining the patients' risk of developing venous thromboembolism (DVT& PE), re-evaluating them periodically, and dealing with them in a safe and effective manner (NSR 1): ICD.13)<sup>(24)</sup>. Nurses are considered always the frontlines in delivering the therapeutic regimens of both prevention and treatment of DVT. They can play a major role in the prevention of postpartum DVT, if well-educated and empowered to increase their level of knowledge and practice<sup>(25)</sup>.

#### **Significance of the study:**

Deep vein thrombosis is a serious medical condition in the postpartum period with potentially life-threatening complications. It is considered the third most common cardiovascular condition following myocardial infarction and stroke. Although DVT is

a major medical problem, it is a treatable and even a preventable disease. However, the prevention of DVT isn't possible as it is needed and expected despite the advance in medical care, the presence of standard guidelines, and effective strategies<sup>(6, 26)</sup>. Many researches in Western and Middle Eastern countries has identified several barriers inhibiting nurses' utilization of DVT preventive measures, including lack of nurse compliance, time, confidence to apply DVT prophylaxis, as well as knowledge deficits, under recognition of DVT signs, inadequate DVT assessment, and misperception of DVT prophylaxis underutilization<sup>(21, 27-28)</sup>. Moreover, nurses may feel a diminished sense of responsibility to carry out a DVT risk assessment and lack standardized tools or protocols for DVT prevention<sup>(5)</sup>. So, this study was aimed to determine the effect of nursing intervention on nurses' performance regarding the prevention of deep vein thrombosis among postpartum women.

#### **The aim of the study**

The aim of this study was to: - Determine the effect of nursing intervention on nurses' performance regarding the prevention of deep vein thrombosis among postpartum women.

#### **Research hypothesis:**

- Nurses' knowledge regarding the prevention of postpartum deep vein thrombosis expected to be enhanced after implementing the nursing intervention.
- Nurses' practices regarding the prevention of postpartum deep vein thrombosis expected to be enhanced

after implementing the nursing intervention.

#### **Subjects and Method**

##### **Subjects**

**I) Research Design:** A quasi-experimental research design was used to fulfill this study (one group, pre/post-test design).

##### **II) Setting:**

The study was carried out in the postpartum units of eight central & general hospitals at El-Gharbia governorate. The governorate encompasses 8 administrative centers including Tanta center, Basyoun Center, Qotour Center, El Santah Center, El Mahalla El Kubra Center, Samannoud Center, Kafr El-Zayat Center & Zifta Center. Each center has main central or general hospital equipped to provide services during pregnancy, labor, and postpartum periods for women who are living in the center and its villages. Selection of these hospitals was based on the following factors: these hospitals were the main hospital in each center with the presence of postpartum units; these hospitals were affiliated to the Ministry of Health and Population which need more attention from researchers. In addition to the increased flow rate of pregnant women who receive postnatal care in these hospitals. This increased the susceptibility for the direct contact of studied nurses to postpartum women. These hospitals were as follows:

- El-Menshawey General Hospital (Tanta center).
- Basyoun Central Hospital (Basyoun Center).
- Qotour Central Hospital (Qotour Center).

- El- Santah Central Hospital (El- Santah Center).
- El Mahalla El Kobra General Hospital (El Mahalla El Kubra Center).
- Samannoud Central Hospital (Samannoud Center).
- Kafr El-Zayat General Hospital (Kafr El-Zayat Center).
- Zefta General Hospital (Zefta Center).

**III) Subjects:** a convenient sample of all available nurses (100 nurses) who were working in the postpartum units of the previously mentioned settings at the time of data collection was included in this study. Each hospital has different number of nurses and classified as follow:

- Nurses who were working at El-Menshawy General Hospital, Tanta center (20 nurses).
- Nurses who were working at Basyoun Central Hospital, Basyoun Center (18 nurses).
- Nurses who were working at Qotour Central Hospital, Qatour Center (8 nurses).
- Nurses who were working at El-Santah Central Hospital, El- Santah Center (8 nurses).
- Nurses who were working at El Mahalla El Kobra General Hospital, El Mahalla El Kubra Center (16 nurses).
- Nurses who were working at Samannoud Central Hospital, Samannoud Center (12 nurses).
- Nurses who were working at Kafr El-Zayat General Hospital, Kafr El-Zayat Center (10 nurses).
- Nurses who were working at Zefta General Hospital, Zefta Center (8 nurses).

**IV) Tools of data collection:** two tools were used for data collection:

### **Tool I: Assessment of Nurses' knowledge regarding the Prevention of Postpartum Deep Vein Thrombosis Structured Questionnaire :**

It was developed by the researchers in Arabic language after reviewing the recent related literature and previous studies with similar objectives<sup>(20-28)</sup>. It included three sub-parts :

**Part one: Nurses' Socio-demographic Data:** It was used to collect basic data about; age, marital status, residence, level of education, years of experience, if they attended any training programs / workshops regarding prevention of DVT during postpartum period, number of training workshops, the institution that organized this training program and their telephone number.

**Part two: Assessment of Nurses' Knowledge regarding Postpartum Deep Vein Thrombosis (DVT):** it included 19 open and closed ended questions covering the following items; definition of DVT, types of thromboembolic disorder during postpartum period, veins most susceptible for DVT, the most common site of DVT leading to pulmonary embolism, time during which the risk of DVT is increased, primary causes of DVT, risk factors for postpartum DVT and its signs& symptoms, diagnostic investigations, medical treatments as well as associated side effects of these medical treatments, precautions when giving anticoagulant therapy, complications of postpartum DVT, definition of pulmonary embolism and its signs& symptoms, and nursing roles toward patient diagnosed with postpartum DVT.

**Part three: Assessment of Nurses' Knowledge regarding the Prevention of Postpartum Deep Vein Thrombosis:** it included 9 closed ended questions to assess nurses' knowledge regarding the following aspects: adequate risk assessment may prevent occurrence of DVT, foot and leg exercises may prevent DVT, elevating legs is necessary to prevent DVT, controlling blood glucose and blood lipids help to prevent DVT, elastic compression stockings may prevent DVT development, early ambulation may prevent DVT, adequate hydration can prevent the occurrence of DVT, Heparin or LMWH may prevent DVT development, intermittent pneumatic compression devices may prevent DVT development.

**Scoring system:**

Each correct & complete answer was taken two marks, while one mark was given for correct and incomplete answer & zero for incorrect or don't know answer. The total score of knowledge (0-56) was categorized as:

- Low level of knowledge: < 60% (0-32).
- Moderate level of knowledge: 60 - < 80% (33-43).
- High level of knowledge:  $\geq 80\%$  (44-56).

**Tool II: Assessment of Nurses' Practices regarding the Prevention of Postpartum Deep Vein Thrombosis Observational Checklist:** This tool was established by Al-Mugheed K, and Bayraktar N (2018)<sup>(26)</sup>, and was adapted by the researchers after reviewing the recent related literatures<sup>(24)</sup> to assess the nurses' preventive practices regarding postpartum DVT, which consisted of

(12) statements regarding assessment of risky women, performing Homan's sign test, giving prescribed anticoagulant drugs, preventive practices and patient teaching aspects.

**Scoring system:**

Each statement regarding the practices was divided into three categories, score (2) for the items which was done correctly and completely, score (1) for the items that done correctly and incompletely, and score (0) for the items that done incorrectly or not done. The total practice score ranged from 0-24 and categorized as follows:

- Unsatisfactory practice: <80% (0-18).
- Satisfactory practice:  $\geq 80\%$  (19-24).

**Method**

**The study was conducted according to the following steps:-**

1. Official letter clarifying the purpose of the study was obtained from the Faculty of Nursing, Tanta University and submitted to El Gharbea Nursing Syndicate which in turn sent official letters to the responsible authorities of the selected settings to obtain their approval and cooperation to carry out the study.
2. **Ethical and legal considerations:**
  - Ethical approval was obtained from the Scientific Research Ethical Committee of Faculty of Nursing, Tanta University before starting the study (Ethical Code: 260 – 5 - 2023).
  - All nurses were informed about the purpose, nature, and benefits of the study at the beginning of data collection and asked to share in the study willingly. Then informed consent was obtained.
  - Confidentiality and privacy were taken into consideration regarding the data collection; the nurses were assured that all data will be used only for the research

purpose and the participant's rights to withdraw at any time if desired.

### 3. **Validity & reliability:**

- Study tools were tested for content and construct validity by a panel of five experts in the field of obstetrics and gynecological nursing. The face validity of the tools were calculated based on experts' opinion after calculating content validity index (%) of its items and it was 92.8% & 90.9% respectively. While, the study tools were measured for internal reliability using Cronbach's Alpha correlation coefficient. The results proved that tools were reliable with a correlational coefficient 0.875 for Tool I and 0.86 for Tool II.

4. **Pilot study:** was carried out on 10% of the nurses (10 nurses), from the previously mentioned settings to test the clarity, feasibility and applicability of the developed tools. The pilot study was conducted before the actual data collection. Accordingly, based on the results of this pilot study no necessary modifications were done, then the tools made ready for use. Data obtained from the pilot study were included.

5. Data collection was conducted over a period of 4 months from the beginning of June 2023 to the end of September 2023. Data were collected from El-Menshawey - General Hospital, followed by Basyoun Central Hospital, then Qotour Central Hospital, El- Santah Central Hospital & Zefta General Hospital, followed by El Mahalla El Kobra General Hospital then Samannoud Central Hospital & Kafr El-Zayat General Hospital. The educational program was conducted firstly at El Gharbia Nursing Syndicate teaching class for both the theoretical and the clinical parts of the program at a rate of 2 group/ week. Then the researchers transferred to the postnatal units in the previously

selected hospitals for evaluation in morning and afternoon shifts, until the predetermined sample size was collected.

### **The educational program was conducted through four phases:**

#### **Phase I: Assessment phase (pre-test):**

- This phase was done before giving the educational program. The researchers met with the studied nurses at the morning and afternoon shifts in postnatal wards of the previously selected hospitals. Nurses were asked to participate in the study after explaining the aim of the study. After that, **nurses** were assessed using **Tool (I) part 1** to collect basic data about their socio-demographic characteristics and **Tool (I) part 2 and part 3** were used to assess nurses' knowledge regarding postpartum DVT and its prevention.

- Nurses' knowledge regarding postpartum DVT and its prevention was assessed individually for each nurse through a pre-test structured questionnaire that lasted for 15-20 minutes in the presence of the researcher for necessary clarification.

- **Tool (II)** was used to assess nurses' practice regarding the prevention of postpartum DVT before implementing the educational program.

Nurses' practice was assessed by the researcher individually for each nurse using the observational checklist.

#### **Phase II: Planning phase:**

- Based on the data collected in the assessment phase about nurses' performance regarding the prevention of postpartum DVT, appropriate educational program was prepared and planned by the researcher for the studied nurses according to the following steps:

#### **A- Preparation of the educational booklet and teaching methods:**

- An educational booklet was developed and designed by the researchers based on nurses' needs and the recent related literature review<sup>(17, 24, 33, 37)</sup> and had been confirmed by experts to enhance nurses' knowledge and practices regarding the prevention of postpartum DVT. It was designed using simple Arabic language and different illustrative pictures to facilitate the nurses understanding of its contents.
  - The educational booklet included two main parts; theoretical part and practical part. **The theoretical part** covered the following items: definition of DVT, types of thromboembolic disorder during postpartum period, veins most susceptible for DVT, the most common site of DVT leading to pulmonary embolism, time during which the risk of DVT is increased, primary causes of DVT, risk factors for postpartum DVT and its signs& symptoms, diagnostic investigations, medical treatments as well as associated side effects of these medical treatments, precautions when giving anticoagulant therapy, complications of postpartum DVT, definition of pulmonary embolism and its signs& symptoms, preventive measures to reduce the risk of postpartum DVT and nursing roles toward patient diagnosed with postpartum DVT. While, **the practical part** included assessment of risky women, performing Homan's sign test, giving prescribed anticoagulant drugs, preventive practices and patient teaching aspects.
  - The educational booklet was distributed for all the participant nurses before the educational sessions to be used as a guide for nurses' self-learning.
- Teaching methods:** PowerPoint presentation, prepared by the researchers included the previously mentioned items that presented in the booklet. In addition to videos, demonstration & re-demonstration and role playing.
- b. Allocation of the studied nurses into sub-groups:**
- The educational program included 4 sessions for each group over a period of 2 days. The total number of nurses was (100 nurses), they were divided into 10 sub-groups as follow:
    - The first group:** 10 nurses from El-Menshawey General Hospital, Tanta center.
    - The second group:** 10 nurses from El-Menshawey General Hospital, Tanta center.
    - The third group:** 9 nurses from Basyoun Central Hospital.
    - The fourth group:** 9 nurses from Basyoun Central Hospital.
    - The fifth group:** 12 nurses (4 nurses from Qotour Central Hospital, 4 nurses from El- Santah Central Hospital & 4 nurses from Zefta General Hospital).
    - The sixth group:** 12 nurses (4 nurses from Qotour Central Hospital, 4 nurses from El- Santah Central Hospital & 4 nurses from Zefta General Hospital).
    - The seventh group:** 8 nurses from El Mahalla El Kobra General Hospital.
    - The eighth group:** 8 nurses from El Mahalla El Kobra General Hospital.
    - The ninth group:** 11 nurses (6 nurses from Samannoud Central Hospital& 5 nurses from Kafr El-Zayat General Hospital).

**The tenth group:** 11 nurses (6 nurses from Samannoud Central Hospital & 5 nurses from Kafr El-Zayat General Hospital).

- The distribution of the study groups in such manner was indicated to not affect the manpower of nurses that provide care for postpartum women.

**Phase III: Implementation phase (educational sessions):**

- The educational sessions was carried out at El Gharbia Nursing Syndicate teaching class to provide appropriate learning environment.
- Each subgroup of the studied nurses received 4 sessions 2 sessions per day over two days at a rate of two groups per week
- The educational sessions started from 10 am to 12 pm.
- Each session lasted approximately 30 to 45 minutes. The sessions were applied separately to each group: These sessions were as follow:

**The first session (theoretical session):** The aim of this session was to provide nurses with **basic knowledge about** definition of DVT, types of thromboembolic disorder during postpartum period, veins most susceptible for DVT, the most common site of DVT leading to pulmonary embolism, time during which the risk of DVT is increased, primary causes of DVT, risk factors for postpartum DVT and its signs & symptoms and diagnostic investigations through using power-point presentation & videos.

**The second session (theoretical session):** The aim of this session

was to provide nurses with **knowledge** about medical treatments as well as associated side effects of these medical treatments, precautions when giving anticoagulant therapy, complications of postpartum DVT, definition of pulmonary embolism and its signs & symptoms. As well as nursing roles toward patient diagnosed with postpartum DVT through using power-point presentation & videos.

**The third session (practical session)** this session focused on enhancing nurses' practical skills regarding assessments of risky women & performing Homan's sign test through demonstration & re-demonstration and role playing.

**The fourth session (practical session)** this session focused on enhancing nurses' practical skills regarding giving prescribed anticoagulant drugs, applying preventive practices and patient teaching aspects through demonstration & re-demonstration and role playing.

**Phase IV: Evaluation phase (Post-test):**

The aim of this phase was to evaluate the nurses' knowledge and practice about the prevention of postpartum DVT. The researchers met with the studied nurses at the morning and afternoon shifts in postnatal wards of the previously selected hospitals for evaluation.

- Nurses' knowledge regarding postpartum DVT and its prevention was assessed immediately after implementation of the educational program and one month later using **Tool (I) part 2 & part 3.**
- Assessment of nurses' practice regarding the prevention of DVT



among postpartum women was done by using **Tool II (observational checklist)**.

#### **Statistical analysis:**

The collected data were coded, entered, tabulated and analyzed using SPSS (Statistical Package for Social Science) version 25 (IBM Corporation, Armonk, NY, USA).

For quantitative data, the range, mean and standard deviation were calculated.

For qualitative data, which describe a categorical set of data by frequency, percentage or proportion of each category, comparison between two groups and more was done using Chi-square test ( $\chi^2$ ).

For comparison between related more than two means of non-parametric data (before, immediate after and one month after implementation of educational guidelines), Friedman Test ( $\chi^2$  value) was calculated.

For comparison between means of two groups of non-parametric data of independent samples, Z value of Mann-whitney test was used. For comparison between more than two means of non-parametric data, Kruskal-Wallis ( $\chi^2$  value) was calculated. Correlation between variables was evaluated using Pearson's correlation coefficient (r).

#### **Results**

**Table (1):** Displays that two fifths of the studied nurses (40.0%) aged more than 40 years old. In relation to the educational level, more than two fifths of the studied nurses (43.0%) had secondary nursing education, while 24.0% had technical institute of nursing and only 5.0% of them had master degree in nursing sciences. It is also estimated that more than two third of the studied nurses (68.0%) were

from rural areas, and most of them (87%) were married.

Regarding years of experience, slightly more than half of the studied nurses (53.0%) had >20 years of experience. The table also demonstrates that most of the studied nurses (88.0%) didn't have any previous training programs regarding the prevention of deep vein thrombosis (DVT) during postpartum period.

**Table ( 2 ):** Exhibits that there is a highly statistical significant positive improvement in the studied nurses knowledge immediately & one month post the nursing intervention compared to pre-nursing intervention program about nearly all the knowledge items s' regarding deep vein thrombosis as  $p=0.0001^*$  respectively.

**Table (3):** Illustrates that there is a highly statistical significant positive improvement in the studied nurses' knowledge immediately & one month post the nursing intervention compared to pre-nursing intervention program about all the knowledge items regarding the prevention of postpartum deep vein thrombosis as  $p=0.0001^*$  respectively.

**Figure (1):** highlighted a highly statistical significant differences in the total score level of knowledge about postpartum DVT and its prevention among the studied nurses before and after implementation of the nursing intervention ( $p= 0.0001$ ), which is improved from low level of knowledge among 93.0% of the studied nurses before the nursing intervention to high level among (100.0% and 92.0% respectively) of them immediately and one month later after implementation of the nursing intervention.

**Table (4):** Exemplifies that there is a highly statistical significant positive improvement in the studied nurses' practices immediately & one month post the nursing intervention compared to pre-nursing intervention program about nearly all the nurses' practices regarding preventive measures of postpartum deep vein thrombosis as  $p=0.0001^*$  respectively.

**Figure (2):** Declares that none of the studied nurses had satisfactory level of total practices about prevention of postpartum DVT before implementing the nursing intervention, which

significantly increased to 97.0% immediately post the nursing intervention, then the percentage slightly decreased to 82.0% one month after implementation of the nursing intervention

**Table (5):** Shows a significant positive correlation between total knowledge scores and total practices scores of the studied nurses pre, immediately and one month after the implementation of the nursing intervention where ( $P=0.001$ ,  $0.003$  and  $0.0001$  respectively).

**Table (1): Socio-demographic characteristics of the studied nurses.**

Socio-demographic characteristics	The studied nurses (n=100)	
	N	%
<b>Age years</b>		
20-30	27	27.0
>30-40	33	33.0
>40	40	40.0
<b>Educational level</b>		
Secondary nursing	43	43.0
Technical nursing institute	24	24.0
Technical health institute	14	14.0
Bachelor of nursing	14	14.0
Master of nursing	5	5.0
<b>Residence</b>		
Rural	68	68.0
Urban	32	32.0
<b>Marital status</b>		
Single	4	4.0
Married	87	87.0
Widow	6	6.0
Divorced	3	3.0
<b>Experience years</b>		
< 5	13	13.0
5-10	12	12.0
>10-20	22	22.0
>20	53	53.0
<b>Attend any training program / workshop regarding prevention of DVT during postpartum period</b>		
Yes	12	12.0
No	88	88.0
<b>If yes, number of training workshops</b>		
One	12	100
<b>If yes, the institution that organized this training program</b>		
Ministry of health	9	75.0
University	3	25.0

**Table (2): knowledge studied nurses regarding deep Vein Thrombosis (DVT) before and after implementation of the nursing intervention.**

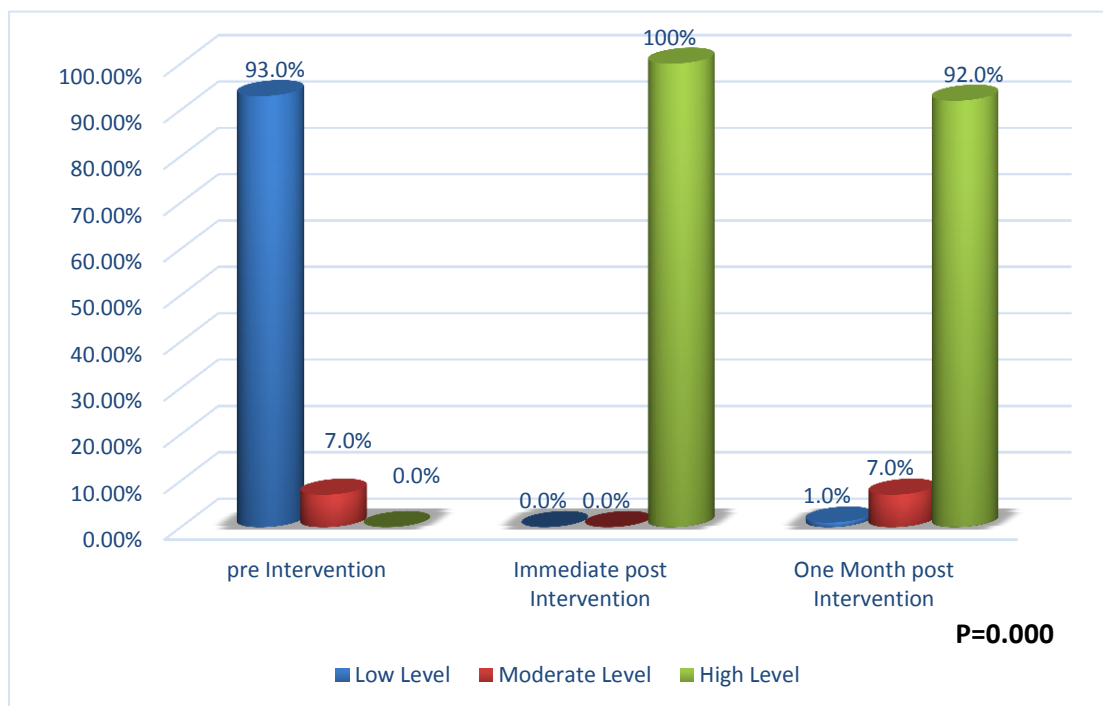
A-Knowledge items about Deep Vein Thrombosis (DVT)	Response of the studied nurses before and after implementation of the nursing intervention (n=100)									$\chi^2$ test	P value
	Pre –nursing intervention			Immediate post intervention			One month post intervention				
	Incorrect or don't know	Correct and incomplete answer	Correct and complete answer	Incorrect or don't know	Correct and incomplete answer	Correct and complete answer	Incorrect or don't know	Correct and incomplete answer	Correct and complete answer		
	n & %	n & %	n & %	n & %	n & %	n & %	n & %	n & %	n & %		
1- Definition of Deep vein thrombosis.	37	50	13	0	2	98	0	4	96	221.203	0.0001*
2- Types of thromboembolic conditions.	17	68	15	0	4	96	0	13	87	178.457	0.0001*
3- The most susceptible veins for DVT.	15	65	20	0	4	96	0	13	87	160.307	0.0001*
4- Time increase risk of DVT.	41	0	59	0	0	100	2	0	98	87.033	0.718
5- Primary causes of DVT.	13	84	3	0	6	94	0	21	79	199.742	0.0001*
6- Site of DVT lead to pulmonary embolism	60	0	40	0	0	100	3	0	97	137.794	0.0001*
7- Risky women for DVT.	15	82	3	0	6	94	0	19	81	204.306	0.0001*
8- Signs and symptoms of DVT.	16	81	3	0	1	99	0	13	87	236.415	0.0001*
9- Diagnosis of DVT.	94	0	6	0	0	100	3	0	97	260.921	0.0001*
10-Treatment of superficial venous thrombosis	49	51	0	0	4	96	0	16	84	239.594	0.0001*
11- Treatment of DVT	46	53	1	0	8	92	0	21	79	215.744	0.0001*
12- Names of Anticoagulants medications.	27	73	0	0	13	87	0	16	84	206.814	0.0001*
13- Aim of Anticoagulants medications	9	72	19	0	0	100	1	14	85	170.892	0.0001*
14- Side effects from Anticoagulants therapy	66	0	34	0	0	100	6	0	94	146.053	0.0001*
15- Nursing precautions regarding anticoagulant therapy	40	60	0	0	3	97	1	18	81	231.970	0.0001*
16- Nursing role toward patient with DVT.	76	24	0	0	5	95	1	18	81	249.791	0.0001*
17- Major complications associated with DVT	38	62	0	0	2	98	0	18	82	238.767	0.0001*
18- Definition of PE	67	0	33	0	0	100	2	0	98	164.088	0.0001*
19- Signs and symptoms of PE	60	40	0	0	3	97	0	17	83	246.533	0.0001*

\*Statistically significant (P&lt;0.05)

**Table (3): Knowledge of the studied nurses regarding prevention of deep Vein Thrombosis (DVT) before and after implementation of the nursing intervention**

B-Knowledge items about prevention of Deep Vein Thrombosis (DVT)	Response of the studied nurses before and after implementation of the educational guidelines (n=100)						$\chi^2$ test	P value
	Pre –intervention		Immediate post intervention		One month post intervention			
	No	Yes	No	Yes	No	Yes		
	n & %	n & %	n & %	n & %	n & %	n & %		
1- Adequate risk assessment may prevent occurrence of DVT	51	49	0	100	1	99	118.688	0.0001*
2- Foot and leg exercises may prevent DVT	69	31	0	100	2	98	170.749	0.0001*
3- Elevating legs is necessary to prevent DVT	78	22	0	100	6	94	186.905	0.0001*
4- Controlling blood glucose and blood lipids help to prevent DVT	100	0	1	99	7	93	267.448	0.0001*
5- Elastic compression stockings may prevent DVT development	82	18	0	100	10	90	188.253	0.0001*
6- Heparin or LMWH may prevent DVT development	24	76	0	100	0	100	36.722	0.0001*
7- Adequate hydration can prevent the occurrence of DVT	100	0	3	97	11	89	246.095	0.0001*
8- Early ambulation may prevent DVT	56	44	0	100	5	95	118.568	0.0001*
9- Intermittent pneumatic compression devices may prevent DVT development	94	6	4	96	4	96	240.642	0.0001*

\*Statistically significant (P&lt;0.05)

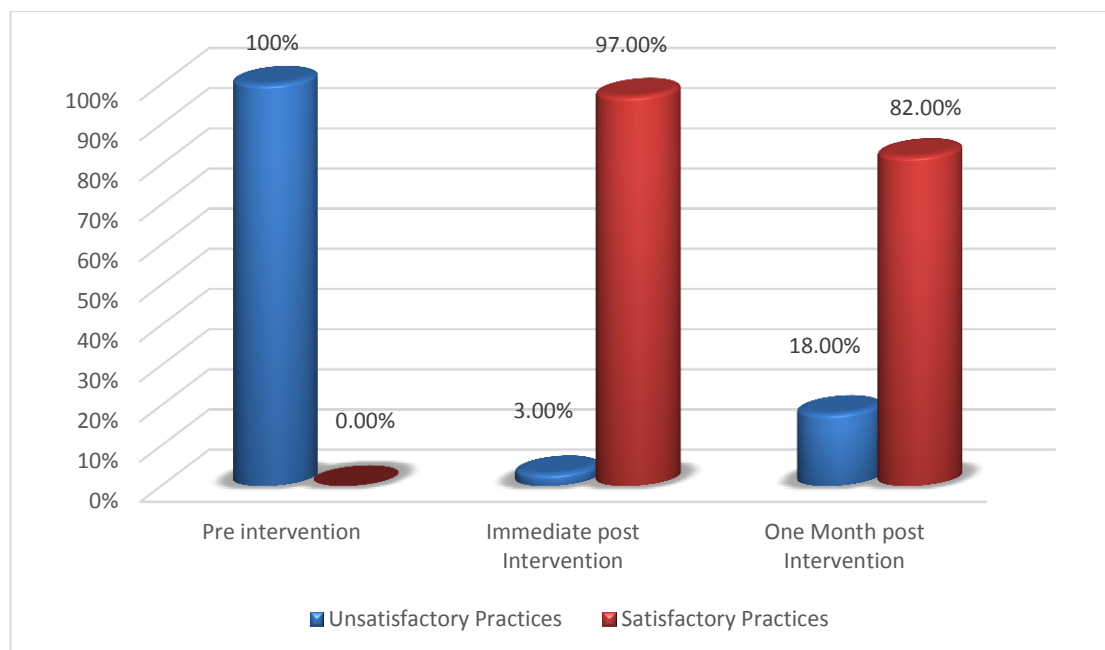


**Figure (1): Level of knowledge of the studied nurses about deep vein thrombosis (DVT) among postpartum women and its prevention before and after implementation of the nursing intervention.**

**Table (4): Practices of the studied nurses regarding prevention of deep Vein Thrombosis (DVT) before and after implementation of the nursing intervention**

Practice items about preventive practices of postpartum Deep Vein Thrombosis (DVT)	Response of the studied nurses before and after implementation of the nursing intervention (n=100)									$\chi^2$ test	P value
	Pre – intervention			Immediate post intervention			One month post intervention				
	Done incorrect or not done	Done correctly and incompletely	Done correctly and completely	Done incorrect or not done	Done correctly and incompletely	Done correctly and completely	Done incorrect or not done	Done correctly and incompletely	Done correctly and completely		
	n & %	n & %	n & %	n & %	n & %	n & %	n & %	n & %	n & %		
1- Assessing the risk factors of DVT regularly	90	10	0	0	10	90	0	24	76	139.821	0.0001*
2- Assessing the patients regularly for signs and symptoms of DVT.	86	14	0	0	4	96	0	22	78	273.993	0.0001*
3- Perform the Homan's sign for high risk women	97	3	0	1	7	92	4	23	73	281.381	0.0001*
4- Checking level of sugar for obese and diabetic women.	<b>80</b>	19	1	0	8	92	2	23	75	243.140	0.0001*
5- Giving prophylactic anticoagulants for postpartum women according to hospital policy	9	34	57	0	0	100	0	3	97	89.074	0.0001*
6-. Encouraging patients to elevate their legs.	68	25	7	0	3	97	1	14	85	225.182	0.0001*
7- Encouraging early ambulation.	15	22	63	0	4	96	0	5	95	58.129	0.0001*
8- Encouraging patients to do foot and leg exercises.	31	30	39	0	7	93	0	10	90	106.849	0.0001*
9- Encourage women to take sufficient fluid intake.	71	11	18	0	5	95	1	10	89	194.953	0.0001*
10- Teaching the patients about the proper use of elastic compression stockings.	100	0	0	3	5	92	6	22	72	282.682	0.0001*
11- Providing information to patients and/or relatives about risks and prevention of DVT.	37	38	25	0	8	92	0	14	86	139.821	0.0001*
12- Teaching women about anticoagulants	80	17	3	0	1	99	4	18	78	245.210	0.0001*

\*Statistically significant (P&lt;0.05)



**Figure (2): Total score level of practices of the studied nurses about prevention of deep vein thrombosis (DVT) among postpartum women before and after implementation of the nursing intervention.**

**Table (5): Correlation between total knowledge scores and total practice scores of the studied nurses regarding the prevention of deep vein thrombosis (DVT) among postpartum women before and after implementation of the nursing intervention.**

Variables	Total knowledge scores of the studied nurses before and after implementation of the nursing intervention (n=100)					
	Pre –intervention		Immediate post intervention		One month post intervention	
	R	P	r	P	R	P
♦Total practice scores	0.763	0.0001*	0.297	0.003*	0.583	0.0001*

\*Statistically significant (P<0.05)

r=Correlation Coefficient



**Discussion:-**

Deep vein thrombosis (DVT) is one of the foremost causes of maternal morbidity and mortality, with a rate intensified to 60-fold during the postpartum period <sup>(29, 30)</sup>. The aim of study was to determine the effect of nursing intervention on nurses' performance regarding the prevention of deep vein thrombosis among postpartum women. This aim and the hypotheses of the study were achieved through the study results which highlighted significant improvement in the nurses' level of knowledge and practices regarding the prevention of postpartum DVT after nursing intervention. The results of the present study revealed that two fifths of the studied nurses aged more than 40 years old, two thirds of them were from rural areas and most of them were married. Also, more than two fifths of the studied nurses had a diploma of nursing.

Even though deep vein thrombosis is a serious medical condition accounting for most cases of pulmonary embolism <sup>(31)</sup>, the results of the present study clarify that most of the studied nurses didn't have any previous training programme about prevention of postpartum deep vein thrombosis. This is supported by **Malk R et al., (2022)** <sup>(32)</sup> who studied the "Efficacy of Training Program on Nurses Performance regarding Preventive Measures of Venous Thromboembolism among Critical Pregnant Women", they found that majority of the studied subjects didn't attend any training courses related to preventive measures of venous thromboembolism. Contrasting result

was stated by **Alyousef HA et al., (2022)** <sup>(33)</sup> who conducted a descriptive cross-sectional study to assess "Nurses' Knowledge and Practices Regarding the Prevention of Deep Vein Thrombosis in Saudi Arabia", they revealed that nearly three quarter of the studied nurses had received previous DVT education.

Therefore, in an effort by the Egyptian government to achieve national safety, out of its belief that patient safety is a goal that must be achieved, the General Authority for Healthcare Accreditation & Regulation (GAHAR) affiliated to the Egyptian Ministry of Health and Population in cooperation with Egyptian Society of Surgeons, Egyptian Society of Obstetrics and Gynecology, Egyptian Society for Intensive Care and Trauma, Egyptian Orthopedic Society and Egyptian Society for Vascular Sciences had launched the "No to venous clots" initiative. This initiative aims to train doctors, pharmacists and nurses on the medical protocol for venous thromboembolism in order to develop a methodology for multidisciplinary work to ensure the quality and safety of the initiative's outputs <sup>(24)</sup>.

**In relation to the total score level of knowledge regarding postpartum DVT and its prevention among the studied nurses**, the results of the present study revealed that most of the studied nurses before the nursing intervention had low level of knowledge. This may be due to the absence of in-service training program, lack of time because of over work load and lack of technology resources to search and upgrade their knowledge. Also, this may

be attributed to the low level of education, as more than two fifths of the studied nurses had only nursing diploma and graduated since a long period of time so they might lose too much of their basic graduation knowledge. In accordance, **Mohammed WI et al., (2019)** <sup>(34)</sup> whose study was to assess "Nurse's Performance Regarding Prevention of Deep Venous Thrombosis among intensive care patients", concluded that more than two third of studied nurse's had unsatisfactory level of knowledge regarding prevention of deep venous thrombosis. Agreed with **Yan et al., (2021)** <sup>(35)</sup> who studied the "Nurses' knowledge, attitudes, and behaviors toward venous thromboembolism prophylaxis: How to do better", stated that the overall knowledge level of the studied nurses was not optimistic. Supported by **Yohannes S et al., (2022)** <sup>(36)</sup> whose study was to assess "Nurses' Knowledge, Perceived Practice, and their Associated Factors regarding Deep Venous Thrombosis (DVT) Prevention in Amhara Region Comprehensive Specialized Hospitals, Northwest Ethiopia, 2021: A Cross-Sectional Study", founded that Knowledge of the nurses regarding the prevention of deep venous thrombosis was inadequate.

While, the total score level of knowledge in the present study was significantly improved to high level among the entire sample immediately after the nursing intervention and among most of them one month later of implementing the intervention, with a highly statistically significant difference regarding knowledge about postpartum

DVT and its prevention pre- and post-intervention. This may be attributed to the effect of the research intervention. Also, the desire of the studied nurses to know, understand and share experience about this major medical problem that affecting postnatal women and how to do better effort to prevent it because some of them faced postpartum DVT cases but they didn't know how to deal with it. The finding of the current study was in agreement with **Malk RN et al., (2022)** <sup>(32)</sup> who reported that the majority of the studied nurses had got statistically significant improvement in their knowledge post the program implementation. This is further stressed by the systematic review on "nurses' knowledge, risk assessment practices, self-efficacy, attitudes, and behaviors towards venous thromboembolism (VTE)" performed by **Al Mugheed K H, and Bayraktar N, (2023)** <sup>(37)</sup> who concluded that comprehensive educational programs and campaigns based on well-established and standardized tools should be provided to nurses to improve their VTE knowledge. However, the result of the present study disagreed with **Alyousef HA et al., (2022)** <sup>(33)</sup>. Based on the result of their study, most of the studied nurses' level of knowledge concerning the prevention of deep vein thrombosis ranged between high and very high. This may be attributed to the high level of education among their studied nurses where, nearly all of them were a bachelor's degree. Also, most of them had received previous DVT education and the primary source was in-service education and nearly all studied nurses agreed to the

presence of a protocol in the hospital for DVT prevention.

**Concerning the total score level of practices regarding prevention of postpartum DVT among the studied nurses**, all of the studied nurses had unsatisfactory practices before implementing the nursing intervention. These unsatisfactory practices may be due to the absence of in-service training programs and refreshing courses regarding preventive measures of DVT during postpartum. Additionally the most important factor from the researchers' point of view, is the absence of clear protocol for prevention of postpartum DVT in the hospital policy. This result was compatible with **Oh H et al., (2017)**<sup>(10)</sup> who conducted a cross-sectional survey to examine the "Clinical nurses' knowledge and practice of venous thromboembolism risk assessment and prevention in South Korea", demonstrated a low level of VTE practice for registered nurses and they concluded that nurses' low level of self-efficacy in VTE prevention/prophylaxis could be a considerable barrier to optimal VTE prevention. Also, **Al Mugheed K H, and Bayraktar N, (2021)**<sup>(38)</sup> who studied "Knowledge and practices of nurses on deep vein thrombosis risks and prophylaxis: A descriptive cross sectional study", stated that nurses had poor practices with respect to the prevention of deep vein thrombosis. Also, on the systematic review conducted by **Al Mugheed K H, and Bayraktar N, (2023)**<sup>(37)</sup> they found five studies reported that nurses had poor VTE practice levels.

The current study also revealed that the total practices score was significantly improved among most of the studied nurses immediately after the nursing intervention and among more than four fifth of them one month after implementation of the intervention. This may be due to demonstration and re-demonstration as well as role playing throughout the clinical educational sessions. This result agrees with **Malk RN et al., (2022)**<sup>(32)</sup> who clarified that nurses' practices improved post program implementation. In contrast, this result is remarkably differ from the results obtained by **Zheng E et al., (2017)**<sup>(39)</sup> who studied the "Current Status of Prevention and Nursing on Venous Thromboembolism among Perioperative Patients with Lung Cancer", illustrated that the clinical staff have already realized the importance of VTE prevention. This may be due to more than half of their hospitals had VTE prophylaxis for hospitalized and discharged patients

**Moreover**, the present study results showed a significant positive correlation between total knowledge scores and total practices scores of the studied nurses' pre, immediately and one month post-intervention. This is in line with **Lau et al., (2017)**<sup>(40)</sup> whose study "Effectiveness of two distinct web-based education tools for bedside nurses on medication administration practice for venous thromboembolism prevention: A randomized clinical trial", stated that education for nurses significantly improves practice. Similarly, **Kiflie A M et al., (2022)**<sup>(41)</sup> whose study "Assessment of knowledge, attitude,

practice and associated factors of venous thromboembolism prophylaxis among health professionals. A cross sectional study" reported that level of knowledge was associated significantly with practice.

### **Conclusion**

Based on the findings of the present study, it can be concluded that most of the studied nurses had unsatisfactory performance (knowledge and practices) regarding prevention of deep vein thrombosis among postpartum women pre the nursing intervention implementation. Meanwhile, their performance was significantly improved post intervention implementation, while this improvement was lowered slightly one month after intervention implementation at follow up, which supported the study hypothesis.

### **Recommendations**

Based on the results of the present study the following recommendations can be suggested:

1. Conducting constant learning plans and continuous in-service training programs about preventive measures of postpartum DVT.
2. Establishing postpartum DVT prevention guideline booklet for obstetric nurses is necessary.
3. Planning regular meetings between nurses and their supervisors should be conducted to evaluate and find ways for improvement.
4. Further studies are recommended to assess knowledge of pregnant and postpartum women about deep vein thrombosis & its prevention.

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